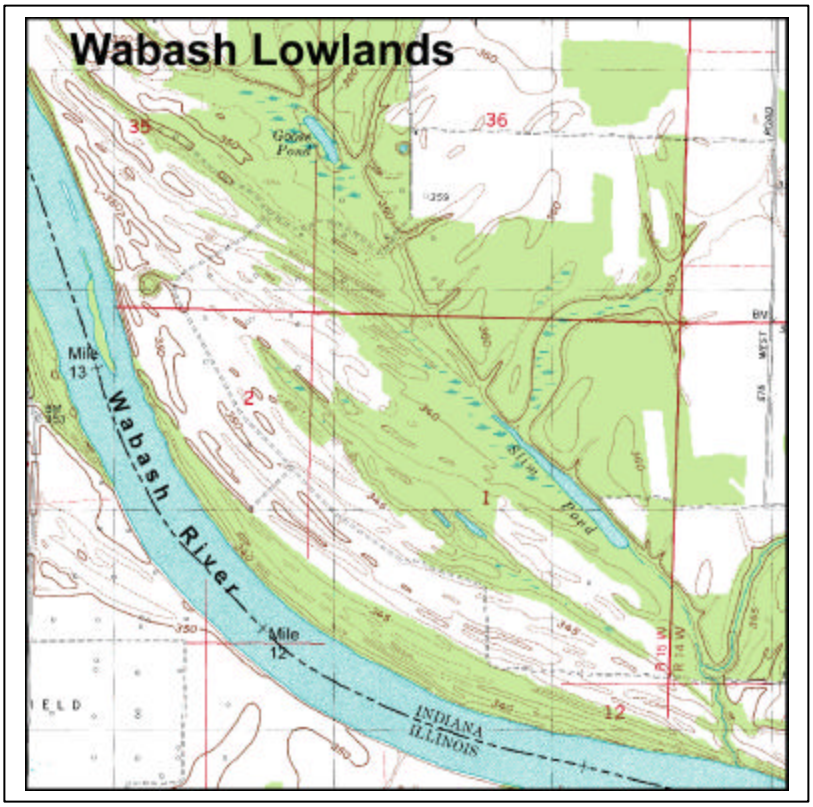
WABASH LOWLANDS EXPANSION & HABITAT RESTORATION (IN-03)

1.0 Location

The proposed Wabash Lowlands Expansion and Habitat Restoration project is located in Posey County, Indiana. The project area is located upstream from the confluence of the Wabash and Ohio rivers. The Wabash River borders the west and southwest edges of the study area between river miles 10.5-13.5. The Wabash Lowlands project area is approximately 4 miles west of the town of Uniontown, Kentucky. The project site is within the Louisville District, U.S. Army Corps of Engineers (USACE).



2.0 Project Goal, Description, and Rationale

The primary goals of the Wabash Lowlands Expansion and Habitat Restoration project involve acquisition and management of the Wabash Lowlands for wildlife habitat enhancement and protection. Property acquisition from willing sellers would help meet goals set by the Indiana Department of Natural Resources (IDNR) Division of Fish and Wildlife, Division of Nature Preserves, and The Nature Conservancy (TNC). Acquisition of lands in the Wabash Lowlands will allow control of water resources in the area and improve water quality. Reforestation and the installation of water control structures are planned for portions of the area. Water control on the area would allow managers to implement specific wetland management strategies, such as moist-soil and greentree reservoir management, on the area.

The following is a general discussion of moist-soil/shallow impoundment management and greentree reservoir management strategies that are likely to be used on the Wabash Lowlands Expansion and Habitat Restoration project area.

Moist-soil/shallow impoundment management is common throughout the midwest and is used as a wetland management tool throughout the United States. Successful moist-soil management is based on knowledge of life histories and habitat characteristics of wildlife. Over time many plant species have adapted to the anaerobic soil conditions associated with the relatively slow flooding and dewatering of wetlands. Many of these plant species are commonly referred to as moist-soil plants.

Naturally occurring moist-soil areas still occur in floodplains, but agricultural practices have reduced the number and size of these areas. State, federal, and private land managers have

the ability to manage wetlands to ensure that suitable habitat for waterfowl and other wetland dependent species is present.

Natural wetland areas usually have a seed bank that is sufficient to produce dense stands of herbaceous vegetation if water drawdowns allow germination. The seed bank is typically very large and contains an adequate seed source to produce an abundance of moist-soil vegetation. For instance, soil samples collected in agricultural fields in southeastern Missouri indicated that the number of large moist-soil seeds varied from approximately 4,000 to over 300,000 per square meter (Fredrickson and Laubhan, 1994).

Moist-soil plants respond to the timing of annual drawdowns and the stage of wetland succession (Fredrickson and Taylor, 1982). Drawdowns at different times during the season will produce different plant species. Drawdowns are typically performed in early, mid, or late season. Mechanical disturbances such as disking or plowing are used to control undesirable species or to shift plant response back to early successional stages and increase seed and tuber production. Alternating delayed drawdowns and mechanical disturbances among a complex of impoundments and among years would provide enough diversity to meet the needs of several species, and would ensure greater use by waterfowl for a longer period of time.

Moist-soil management offers managers tremendous potential to produce plants that yield valuable food sources to migrating waterfowl and other waterbird species. This management practice emulates the natural dewatering and drying conditions in wetlands through artificial drawdowns with the use of water control structures. The exposure of mudflats that have been inundated allows the growth of plants, which produce abundant seeds, tubers, browse, and habitat for wildlife. Water management allows managers to control drawdown timing and rates, which will alter the species of moist-soil plants that germinate in a specific impoundment. The ability to manage several impoundments in close proximity to one another allows managers to provide a variety of different food sources in the same season. By incorporating timing of drawdown (early, middle, or late growing season) and rate of drawdown (slow or fast), a variety of plant response can be obtained. In southeastern Missouri for example, early drawdowns typically produced smartweeds, barnyard grass, and chufa flatsedge. While late drawdowns usually produced redroot flatsedge, toothcup, and aster.

Moist-soil plants provide structure for aquatic invertebrates, and these invertebrates provide important prey for waterfowl. The numbers and biomass of invertebrate populations are related to the biomass and structure of the plant community. Many invertebrate groups that colonize moist-soil impoundments have high mobility that allows them to colonize new locations, and have high fecundity that, following seasonal drought conditions, allows them to produce large numbers of eggs quickly (Fredrickson and Reid, 1988). This characteristic of invertebrate communities provides managers with several options to produce foods for wildlife. Plants that are not good seed producers but have a complex vegetation structure become important because they can supply optimum invertebrate habitat. In some cases, plants considered undesirable because they form monocultures could be converted to litter by disking or mowing, which would subsequently provide a detrital base for invertebrate populations. By timing water manipulations to coincide with target species migration, poor quality plant foods that are manipulated by disking or mowing can be converted into important invertebrate foods. In addition, the manipulated habitat in the moist-soil impoundments would have ideal conditions for increased response of seed producing plants the following growing season.

Proper development of a complex of moist-soil impoundments requires considerations of several factors including water source, dewatering capabilities, impoundment sizes, levee location, target species, and locations of other wetlands in the area. A dependable source of water is among the most important factors to consider.

Greentree reservoir management refers to flooding live forests during the dormant season, usually by gravity flow from reservoirs or by pumping groundwater or stream water into wetlands. By flooding during the dormant season, trees survive the flooding and continue to develop foliage when the floodwaters are withdrawn. The strategy is common in deciduous forests of the southern United States. Many forested wetlands occur as riverine swamps and are seasonally flooded. In the southeastern United States, flooding of forested wetlands is primarily during the dormant season, but extends into early spring (Heitmeyer et al., 1989). Levee construction and water control structures are needed in many areas to provide dependable flooding of forested wetlands. Where extensive clearing and drainage have occurred in lowland hardwood forests, greentree reservoirs often provide the only available habitat for migrating and wintering waterfowl.

Water discharge in greentree reservoirs is an important factor for managers to consider. Poor discharge control due to beaver dams, inadequate ditch size, or overgrown ditches can alter the rate of discharge. Flooding too deeply or for an extended time period can result in high mortality rates of valuable oak species. Flooding regimes in forested wetlands require better planning than in other wetlands because management that damages or kills trees has long-term implications. For example, herbaceous vegetation can recover from flood induced mortality in one season, but forest regeneration would require several decades. Water level management should emulate the natural variation of flooding conditions within and among years to maintain productivity and diversity (Fredrickson and Batema, 1992).

Flooding in forested wetlands increases the availability of oak acorns to waterfowl species such as wood ducks and mallards. Fruits and seeds from other tree species represent an additional food resource. Tupelo drupes, samaras from elm, ash, and maple, and seeds from woody vegetation such as buttonbush provide food sources that may be used during the annual cycle. However, repeated flooding without much variability reduces the production of acorns and can decrease seedling recruitment into the forest stand. Incorporating variable water levels and winters without flooding to mimic natural conditions may be necessary for decomposition of detritus and cycling of nutrients (Fredrickson and Laubhan, 1994).

Invertebrates such as shredders (aquatic sowbugs and sideswimmers) and collectors (fingernail clams), are abundant in the flooded leaf litter of lowland forests (Hubert and Krull, 1973) and provide an important source of food for migrating and wintering waterfowl. Forest invertebrates respond within two weeks of flooding and reach peak abundance and biomass by the end of winter. Invertebrate numbers are increased when flooding is slow and water depths are less than one foot. Rapid flooding during periods of high temperature can result in anoxic conditions. Rattailed maggots and aquatic earthworms are more common in anoxic conditions. Flooding depths of less than four inches or gradual drawdowns over extended time periods increases invertebrate response and increases their availability to wildlife (Fredrickson and Laubhan, 1994). Gradual drawdowns also concentrate invertebrates for migrating waterfowl and retain nutrients on the site.

3.0 Existing Conditions

Terrestrial/Riparian Habitat: The primary terrestrial and riparian resources on the area are agricultural lands and bottomland forested areas. Agricultural crops such as corn, soybeans, and wheat are the primary crops. The forested areas are dominated by tree species such as silver maple (*Acer saccharinum*), and green ash (*Fraxinus pennsylvanica*). Lizard's tail (*Saururus cernuus*), false nettle (*Boehmeria cylindrica*), stinging nettle (*Urtica dioica*), and poison ivy (*Toxicodendron radicans*) dominated the herbaceous plant community on the area.

Aquatic Habitats: The Wabash River borders the Wabash Lowlands project area to the west and southwest. The aquatic habitats on the project area mainly consist of shallow backwater sloughs and some small swales that pond water. Slim Pond, which is a remnant of the meandering Wabash River, provides shallow open water habitat on the site.

Wetlands: Portions of the existing bottomland forest area and the backwater sloughs and small swales would be considered jurisdictional wetland habitat. These areas are dominated by hydrophytic vegetation such as silver maple, green ash, and Lizard's tail. Overbank flooding from the Wabash River provides the main source of water to these wetland sites. Some areas of bald cypress (*Taxodium distichum*) swamp are also present on the project area.

Federally-Listed Threatened and Endangered Species: According to the U.S. Fish and Wildlife Service (USFWS), there are 11 federally-listed endangered species and 1 federally-listed threatened species known to occur in Posey County, Indiana. These species are listed on Table 1. The riparian corridor adjacent to the Ohio River may provide summer roost habitat for the Indiana bat. Preferred tree species would include a mixture of oaks (*Quercus* spp.), silver maple (*Acer saccharinum*), cottonwood (*Populus deltoides*), and shagbark hickory (*Carya ovata*) (INHS, 1996). The riparian corridor would also provide feeding/foraging habitat for the Indiana bat. Bald eagles may utilize forested areas for roosting/perching habitat and feed in the open water areas. There are no known eagle nests in the project area.

All of the mussels are freshwater species that typically inhabit medium to large river systems. The mussels are typically found in habitats with substrates that range from silt to gravel, and in water depths from 0.5 to 8.0 meters. These species are generally associated with moderate to fast flowing water. There does not appear to be suitable habitat for these species in the immediate vicinity of the project area.

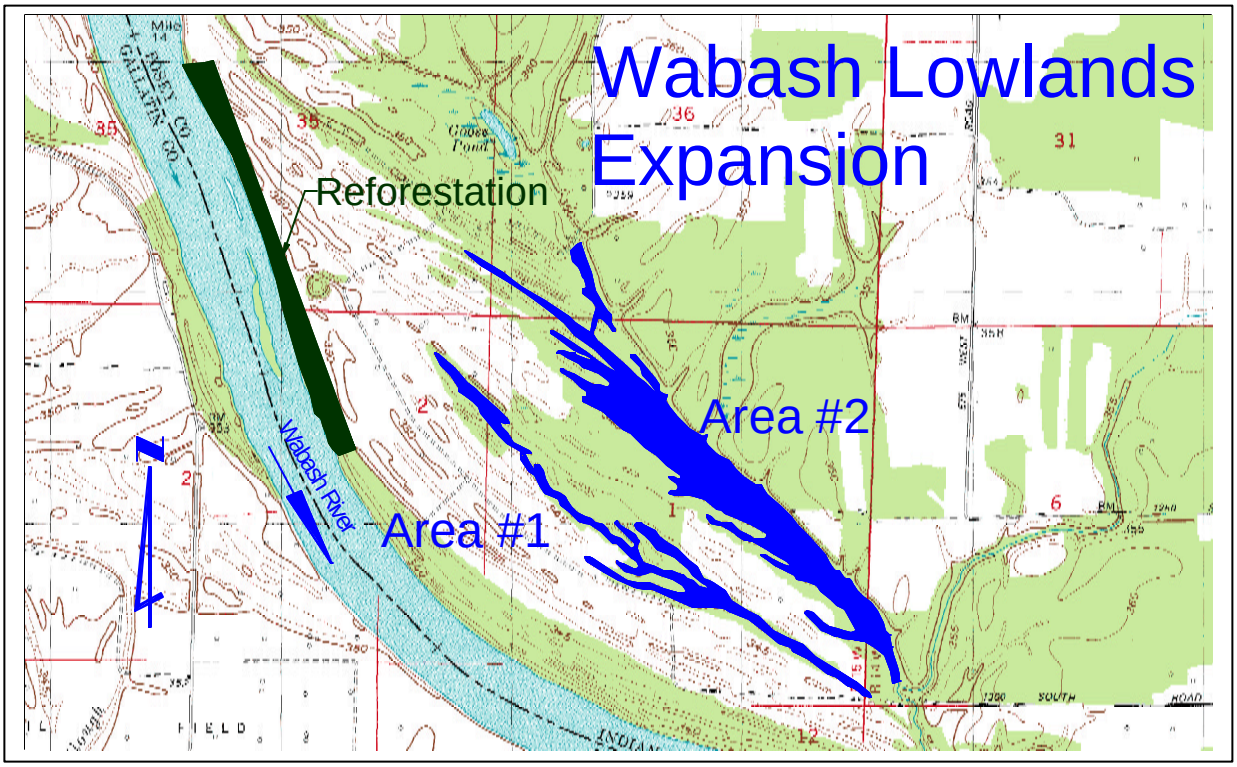
The American burying beetle is generally associated with upland habitats such as grassland prairie, forest edge, and shrubland. It is unlikely that the beetle would be found on the project area.

Table 1. Federally-listed species known to occur in Posey County, Indiana.

Common Name	Scientific Name	Federal Status	Potential Habitat Present
Indiana bat	*Myotis sodalis*	Endangered	Yes
bald eagle	*Haliaeetus leucocephalis*	Threatened	Yes
eastern fanshell pearly mussel	*Cyprogenia stegaria*	Endangered	No
tubercled blossom mussel	*Epioblasma torulosa torulosa*	Endangered	No
pink mucket pearly mussel	*Lampsilis abrupta*	Endangered	No
ring pink mussel	*Obovaria retusa*	Endangered	No
white wartyback mussel	*Plethobasus cicatricosus*	Endangered	No
orange-foot pimpleback mussel	*Plethobasus cooperianus*	Endangered	No
Clubshell mussel	*Pleurobema clava*	Endangered	No
rough pigtoe mussel	*Pleurobema plenum*	Endangered	No
fat pocketbook mussel	*Potamilus capax*	Endangered	No
American burying beetle	*Nicrophorus americanus*	Endangered	No

Source: U.S. Fish and Wildlife Service, 1999

4.0 Project Diagrams



5.0 Engineering Design, Assumptions, and Requirements

5.1 Existing Ecological/Engineering Concern

The primary concern is the lack of water control and the desire to regulate water levels for multiple benefits, including habitat enhancement, protection, and restoration, waterfowl hunting, and non-consumptive public uses such as bird watching.

5.2 Land Acquisition

Land acquisition for the Wabash Lowlands project area would be accomplished through purchase of land from willing sellers within the project area. Approximately 226 acres of privately owned land would be affected by the proposed project. Long term flowage/management easements may be purchased for this area in lieu of acquisition.

5.3 Bottomland Reforestation

Reforestation of a riparian corridor along the Wabash River is desired to increase forested habitat on the area. A corridor 300 feet wide and approximately one mile in length is suggested as a potential area for reforestation. This area would total approximately 36 acres.

5.4 Area #1

A small levee 4.5-feet high and 70 feet in length would be constructed in conjunction with a flashboard-riser water control structure to provide a moist soil unit. The created wetland would be approximately 28 acres. A water control structure constructed of

reinforced concrete would be installed within the levee at the downstream end of the pool. The flow line elevation would be 5.5 feet below the bottom of the wetland pool. A metal channel would be installed vertically in the flashboard slots because wood and metal stop-logs do not seal well against concrete and considerable leakage can occur. The height of the opening would be 4.5 feet, allowing for 1 foot of freeboard. The width of the opening is 2 feet and would allow for the wetland to be drained in approximately 3 days. A grass lined emergency spillway would be provided to accommodate storm events. Concrete wingwalls on upper and lower sides of the levee would be used to protect the levee from erosion and reduce seepage around the control structure. Water regulation is achieved by placing "stop-logs" or "boards" in control slots to the desired elevation. Logs are commonly made of treated timber, metal, concrete, or PVC. In addition, a groundwater well would be provided to allow water control during low water periods. The well is equipped with a pump that can pump 300 GPM.

5.5 Moist Soil Unit #2

A small levee 4.5-feet high and 100 feet in length would be constructed in conjunction with a flashboard-riser water control structure to provide a moist soil unit. The created wetland would be approximately 86 acres. A water control structure constructed of reinforced concrete would be installed within the levee at the downstream end of the pool. The flow line elevation would be 5.5 feet below the bottom of the wetland pool. A metal channel would be installed vertically in the flashboard slots because wood and metal stop-logs do not seal well against concrete and considerable leakage can occur. The height of the opening would be 4.5 feet, allowing for 1 foot of freeboard. The width of the opening is 2 feet and would allow for the wetland to be drained in approximately 3 days. A grass lined emergency spillway would be provided to accommodate storm events. Concrete wingwalls on upper and lower sides of the levee would be used to protect the levee from erosion and reduce seepage around the control structure. Water regulation is achieved by placing "stop-logs" or "boards" in control slots to the desired elevation. Logs are commonly made of treated timber, metal, concrete, or PVC. In addition, a groundwater well would be provided to allow water control during low water periods. The well is equipped with a pump that can pump 300 GPM.

5.6 Planning/Engineering Assumptions

- The levees would be created using materials from on site.
- The water control structure would be designed to allow complete drainage of the wetland in approximately three days.

6.0 Cost Estimate (Construction)

Table 2. Engineering and Design Costs.	
Item	**Cost**
Land Acquisition	$231,000
Riparian Corridor Reforestation	$8,000
Area #1	$44,100
Area #2	$44,300
Mobilization	$11,000
Total	**$338,400**

7.0 Schedule

Table 3. Development and Reforestation	
Item	**Time**
Land Acquisition	1-3 years
Riparian Corridor Reforestation	1-3 years
Area #1 (20 Days)	1-3 years
Area #2 (20 Days)	1-3 years
Mobilization (4 Days)	1-3 years
Total	1-3 years

8.0 Expected Ecological Benefits

Terrestrial/Riparian Habitats: The implementation of the Wabash Lowlands Expansion and Habitat Restoration project would provide beneficial impacts to terrestrial and riparian resources in the project area. Reforestation would decrease the amount of forest fragmentation on the area and would benefit a number of neotropical migrants, deer, and other resident wildlife species.

Aquatic Habitats: Reforestation of the shoreline buffers would reduce erosion and sedimentation problems in the project area, and increase water quality. The creation of seasonally flooded moist-soil impoundments would provide temporary aquatic habitat for invertebrates and amphibians.

Wetlands: Wetland resources in the project area will benefit from installation of the water control structure. Water control would allow management activities such as moist-soil management and greentree reservoir management to be implemented, which would benefit waterfowl, shorebirds, and a number of migratory birds of management concern.

The construction of moist-soil impoundments on the area would benefit wetland species such as waterfowl, rails, wading birds, and shorebirds. Successful moist-soil management practices have resulted in seed yields as high as 1350 kg/hectare on impoundments at Mingo NWR, Missouri (Reid et al., 1989). Moist-soil plants also provide structure for aquatic invertebrates, and these invertebrates provide important prey for waterfowl. Approximately 84% of bird species that utilized moist-soil impoundments in eastern Missouri consumed invertebrates as part of their diet (Fredrickson and Reid, 1986).


Potential moist-soil unit


Potential greentree reservoir

Greentree reservoir construction and management would also benefit many wetland species. Flooding strategies on greentree reservoirs would produce invertebrate populations earlier, more consistently, and in greater numbers relative to naturally flooded sites. Water management would also allow waterfowl to take advantage of seeds and fruit produced by trees in the bottomland hardwood ecosystem. Several species of waterfowl use forested wetlands during part of their annual life cycle. Mallards for example, use forested wetlands extensively during molting and pairing to obtain food resources and protection from predators (Reinecke et. al, 1989).

Federally-Listed Threatened and Endangered Species: Reforestation of the project site could potentially benefit the Indiana bat and bald eagle. Successful reforestation would provide potential summer roosting habitat for the Indiana bat, and potential roosting/perching habitat for the bald eagle. There would be no foreseeable beneficial impacts to the federally-listed endangered mussel species or the American burying beetle as a result of implementing the proposed project.

Socioeconomic Resources: Implementation of the proposed project could result in long term beneficial impacts to socioeconomic resources through increased recreational activities. Hunting and birdwatching opportunities would be increased by the project.

9.0 Potential Adverse Environmental Impacts

Terrestrial/Riparian Habitats: Potential long term adverse impacts to terrestrial and riparian resources in the area may result due to increase public use of the project area. Problems such as increased vehicular traffic, littering, and wildlife disturbance could occur after the proposed project is finished. Short-term adverse impacts could result from construction related activities.

Aquatic Habitats: Construction activities on the area could cause some short term impacts to aquatic resources on the area. Increased erosion and sedimentation could result during the construction of the moist-soil impoundments and water control structures.

Wetlands: There would be no reasonably foreseeable adverse impacts to jurisdictional wetlands as a result of implementing the proposed project.

Federally-Listed Threatened and Endangered Species: There would be no foreseeable adverse impacts to federally-listed threatened or endangered species as a result of implementing the proposed project.

Socioeconomic Resources: There would be potential for some adverse socioeconomic impacts. Implementation of the proposed project would take some agricultural lands out of production, which could result in decreased opportunities for tenant farming.

10.0 Mitigation

Minor impacts associated with site restoration may occur during the construction of this project, however, no significant adverse impacts are expected. The use of best management practices and proper construction techniques would minimize adverse water quality impacts. No other mitigation would be necessary for this project.

11.0 Preliminary Operation and Maintenance Costs:

Table 4. Operation and Maintenance Costs		
Maintenance	**Frequency**	**Costs**
Area #1	25 Years	$5,000
Area #2	25 Years	$5,000

12.0 Potential Cost Share Sponsor(s)

- Indiana Department of Natural Resources
- The Nature Conservancy
- Ducks Unlimited
- Wild Turkey Federation
- Private corporations

13.0 Expected Life of the Project

As presently envisioned the Wabash Lowlands project area will be managed in perpetuity for the benefit of natural resources by the Indiana Department of Natural Resources.

14.0 Hazardous, Toxic, and Radiological Waste Considerations

Potential impacts of hazardous, toxic, and radiological waste (HTRW) at the site were visually assessed during a site visit.

Site Inspection Findings.

The project site consist of the Wabash River drainage just upstream from the confluence with the Ohio River in Posey County, Indiana. The project involves approximately 1,298 acres of Wabash Lowlands owned by Indiana Department of Natural Resources and The Nature Conservancy. The nearest town to the Ohio River-Wabash River confluence is Uniontown, Kentucky, which is located along the south bank of Ohio River at river mile 842.5.

The following environmental conditions were considered when conducting the June 29, 1999 project area inspection:

- Suspicious/Unusual Odors;
- Discolored Soil;
- Distressed Vegetation;
- Dirt/Debris Mounds;
- Ground Depressions;
- Oil Staining;
- Above Ground Storage Tanks (ASTs);
- Underground Storage Tanks (USTs);
- Landfills/Wastepiles;
- Impoundments/Lagoons;
- Drum/Container Storage;

- Electrical Transformers;
- Standpipes/Vent pipes;
- Surface Water Discharges;
- Power or Pipelines;
- Mining/Logging; and
- Other.

None of the environmental conditions listed above were observed on the project area.

15.0 Property Ownership & River Access

Selected data on properties immediately adjacent to or within each concept site was collected from the county courthouse of the respective county of each site. Data collected included map and parcel identification number, property owner's name and mailing address, acreage of the potentially affected parcel, and market value of the parcel. This procedure involved obtaining a plat or parcel map of the site and surrounding area which identified each parcel with a corresponding map and parcel number. The map\parcel identification number was subsequently used to determine the property owner's name and mailing address from records in the County Assessor's or County Auditor's office. Plat\parcel maps were collected for each site.

The market value of each parcel as contained in the property tables reflects the assessed valuation to supposedly market value ratio used in each State for taxation purposes. These assessed values reflect 1998 assessments. The assessed valuation ratio is 33.3 percent for Indiana.

The above ratios were used to approximate the market value of each property. However, in many instances the resultant market value calculated under the above procedure is considerably below the actual value of the land in the real market. Local real estate brokers could provide a more accurate estimate of actual land values.

The collected property data indicate that both public and private lands are adjacent to the Wabash Lowlands Expansion and Habitat Restoration area. Private lands will be needed and/or disturbed for this project. A large portion of the property under consideration is in private ownership, therefore easements or other agreements will need to be made prior to further progress.

Table 5. Property Characteristics

Site Name: Wabash Lowlands Expansion
Location: Posey County, Indiana

Map/Parcel Number	Owner	Mailing Address	Market Value	Acreage
344/04	Indiana Department of Natural Resources	402 West Washington St. Indianapolis, IN 46204		262.00
345/01	Donna Schmidt	2919 Spencer Ditch Road Mt. Vernon, IN. 47620	$15,000	40.00
345/02-01	Unknown			
359/01	Indiana Department of Natural Resources	402 West Washington St. Indianapolis, IN 46204		413.00
359/04	John Newman	717 South Boeke Road Evansville, IN. 47716	$15,000	80.00
359/05	John Newman	717 South Boeke Road Evansville, IN. 47716	$9,600	40.00
359/06	Anna Zuspann	1100 East 5th Street Mt. Vernon, IN. 47620	$8,500	40.00
360/01	Indiana Department of Natural Resources	402 West Washington St. Indianapolis, IN 46204		206.00
361/01	Amy Isaac & James Vollmer	C/o Michael Vollmer 424 Mill Mt. Vernon, IN. 47620	$100	26.00

* Denotes improvements on property.

16.0 References

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APPENDIX A Threatened & Endangered Species

APPENDIX B Plan Formulation and Incremental Analysis Checklist

Project Site Location: The proposed Wabash Lowlands Expansion and Habitat Restoration project is located in Posey County, Indiana. The project area is located just upstream from the confluence of the Wabash and Ohio rivers, and approximately 4-5 miles west of the town of Uniontown, Kentucky. The project site is within the Louisville District, U.S. Army Corps of Engineers (USACE).

Description of Plan selected: The primary goals of the Wabash Lowlands Expansion and Habitat Restoration project involve land acquisition from willing sellers. Property acquisition will help meet goals set by the Indiana Department of Natural Resources (INDNR) Divisions of Fish and Wildlife and Nature Preserves and The Nature Conservancy (TNC). Acquisition of lands in the Wabash Lowlands will allow control of water resources in the area and improve water quality. Reforestation and the installation of water control structures are planned for some portions of the area.

Alternatives of the Selected Plan:

Smaller Size Plans Possible? Yes and description

Reduce the amount of land acquired.

Larger Size Plan Possible? Yes and description

Increase the amount of land acquired.

Other alternatives? Yes

Consider the purchase of long-term easements and/or leases from surrounding landowners.

Restore/Enhance/Protect Terrestrial Habitats? Yes **Objective numbers met** T1, T3

Restore, Enhance, & Protect Wetlands? Yes **Objective numbers met** W1, W4

Restore/Enhance/Protect Aquatic Habitats? Yes **Objective numbers met** A1, A8

Type species benefited: Resident and migratory wildlife, especially waterfowl

Endangered species benefited: Potential benefits to Indiana bat and bald eagle

Can estimated amount of habitat units be determined: Yes Initially 200-250 acres of habitat will be acquired.

Plan acceptable to Resources Agencies?
U.S. Fish & Wildlife Service?
State Department of Natural Resources? Yes Indiana Dept. of Natural Resources

Plan considered complete? Yes **Connected to other plans for restoration?**

Real Estate owned by State Agency? Yes **Federal Agency?** No
Real Estate privately owned? Yes
If privately owned, what is status of future acquisition Currently underway

Does this plan contribute significantly to the ecosystem structure or function requiring restoration? What goal or values does it meet in the Ecosystem Restoration Plan?

Yes The plan provides additional habitat and habitat diversity for terrestrial and wetland species.

Is this restoration plan a part of restoration projects planned by other agencies? (i.e. North American Waterfowl Management Plan, etc.)

Unknown

In agencies opinion is the plan the most cost effective plan that can be implemented at this location?

Can this plan be implemented more cost effectively by another agency or institution?
Yes / No
Who:

From an incremental cost basis are there any features in this plan that would make the project more expensive than a typical project of the same nature? For embayment type plans is there excessive haul distance to disposal site? More expensive type disposal? Spoil that requires special handling/disposal?

Potential Project Sponsor:

Government Entity:_____
Non-government Entity _____

Corps Contractor _____Date_____

U.S. Fish & Wildlife Representative _____Date_____

State Agency Representative _____Date _____

U.S. Army Corps of Engineers Representative _____Date _____

Terrestrial Habitat Objectives

T1 Riparian Corridors

T2 Islands

T3 Floodplains

T4 Other unique habitats (canebrakes, river bluffs, etc.)

Wetland Habitat Objectives

W1 Forested Wetlands: Bottomland Hardwoods

W2 Forested Wetlands: Cypress/Tupelo Swamps and other unique forested wetlands

W3 Scrub/Shrub Emergent Wetlands: isolated from the river except during high water and contiguous (includes scrub/shrub wetlands in embayments and island sloughs)

W4 Herbaceous emergent wetlands: managed moist-soil impoundments

Aquatic Habitat Objectives

A1 Backwaters (sloughs, embayments, oxbows, bayous, etc.)

A2 Riverine submerged and aquatic vegetation

A3 Sand and gravel bars

A4 Riffles/Runs (tailwaters)

A5 Pools (deep water, slow velocity, soft substrate)

A6 Side Channel/Back Channel Habitat

A7 Fish Passage

A8 Riparian Enhancement/Protection

APPENDIX C Micro Computer-Aided Cost Engineering System (MCACES)